CLAIMS

What is Claimed is:

1. A device for the noninvasive monitoring of a physiologic characteristic of a patient's blood, comprising:

a tissue probe having a first radiation emitter with a first wavelength and a first radiation detector configured to receive the first wavelength after absorbance through the patient's blood;

a position sensor for determining the relative height compared to a level corresponding to the patient's heart; and

a controller for computing the physiologic characteristic of the patient's blood based on the absorbance of the first wavelength of radiation and the relative height of the probe.

2. The device of Claim 1, wherein the first wavelength is selected from the group consisting of visible light, infrared light, and ultraviolet light.

3. The device of Claim 1, wherein the probe is configured to monitor tissue selected from the group consisting of hands, fingers, feet, toes, ears, earlobes, nares, lips, and tongue.

4. The device of Claim 1, wherein the tissue probe further comprises a second radiation emitter with a second wavelength and a second radiation detector configured to receive the second wavelength after absorbance through the patient's blood.

5. The device of Claim 4, wherein the second wavelength is different than the first wavelength.

6. The device of Claim 1, wherein the device further comprises a second probe having a second radiation emitter with a second wavelength and a second radiation detector configured to receive the second wavelength after absorbance through the patient's blood and wherein the controller further computes the physiological characteristic by comparing the absorbance detected by the first detector and the second detector.

7. The device of Claim 1, wherein the probe further comprises at least one electrocardiogram lead.

8. A device for the noninvasive monitoring of a physiologic characteristic of a patient's blood, comprising:

a tissue probe having a first radiation emitter with a first wavelength and a first radiation detector configured to receive the first wavelength after absorbance through the patient's blood secured to a desired portion of the patient's tissue ;

a movement generator for inducing a position change of the probe with respect to a level corresponding to the patient's heart; and

a controller for computing the physiologic characteristic of the patient's blood based on the absorbance of the first wavelength of radiation and the relative position of the probe.

9. The device of Claim 8, wherein the movement generator induces a known position change of the probe.

10. The device of Claim 8, wherein the tissue probe further comprises a second radiation emitter with a second wavelength and a second radiation detector configured to receive the second wavelength after absorbance through the patient's blood.

11. The device of Claim 8, wherein the device further comprises a second probe having a second radiation emitter with a second wavelength and a second radiation detector configured to receive the second wavelength after absorbance through the patient's blood and wherein the controller further computes the physiological characteristic by comparing the absorbance detected by the first detector and the second detector.

12. The device of Claim 8, wherein the probe further comprises at least one electrocardiogram lead.

13. A method for noninvasively determining a physiological characteristic of a patient's blood comprising the steps of:

providing a tissue probe having a first radiation emitter with a first wavelength and a first radiation detector configured to receive the first wavelength after absorbance through the patient's blood;

measuring absorbance of the patient's blood by emitting a first radiation through the patient's blood and detecting the radiation after passage through the patient's

blood with the probe at a first position relative to a level corresponding to the patient's heart;

computing a blood parameter at the first position based on the absorbance;

moving the probe relative to a level corresponding to the patient's heart to a second position;

measuring absorbance at the second position;

computing the blood parameter based on the absorbance at the second position; and

determining the physiological characteristic by comparing the absorbance at the first and second position.

14. The method of Claim 13, further comprising the steps of:

computing the hydrostatic pressure difference between the first and second position; and performing self-calibration based upon the hydrostatic pressure difference.

15. The method of Claim 13, further comprising the steps of:

computing the hydrostatic pressure difference between the first and second position;

comparing the blood parameter to the hydrostatic pressure difference; and

deriving a mathematical function relating hydrostatic pressure to the blood parameter.

16. The method of Claim 15, wherein the physiological characteristic comprises arterial blood pressure.

17. The method of Claim 15, wherein the blood parameter is selected from the group consisting of pulse amplitude, pulse delay, pulse velocity, pulse contour, flow velocity and flow delay.

18. The method of Claim 13, further comprising the steps of:

continuing to change the position of the probe relative to the level corresponding to the patient's heart;

comparing the rate of change of absorbance with the position relative to the level corresponding to the patient's heart; and

determining central venous drainage from the rate of change of absorbance.

19. The method of Claim 18, further comprising the steps of determining the hydrostatic pressure difference between the position of the first probe corresponding to central venous drainage and the level corresponding to the patient's heart and calculating the central venous pressure from the hydrostatic pressure difference.

20. A method for noninvasively determining a physiological characteristic of a patient's blood comprising the steps of:

providing a first tissue probe having a first radiation emitter with a first wavelength and a first radiation detector configured to receive the first wavelength after absorbance through the patient's blood;

providing a second tissue probe having a second radiation emitter with a second wavelength and a second radiation detector configured to receive the second wavelength after absorbance through the patient's blood;

positioning the first and second probes at locations on the patient;

measuring absorbance of the patient's blood at the opposing locations by emitting radiation through the patient's blood and detecting the radiation after passage through the patient's blood;

determining a blood parameter by comparing absorbance at the locations; and

computing the physiological characteristic of the patient's blood.

21. The method of Claim 20, wherein the step of positioning the first and second probes comprises positioning the probes at opposing locations on the patient, further comprising the steps of:

measuring blood pressure;

determining the pulse delay by comparing absorbance at the opposing locations;

estimating the pulse distance differential;

computing pulse velocity from pulse distance and pulse delay; and

computing flow wave velocity from the pulse velocity.

22. The method of Claim 21, further comprising the steps of estimating the aortic root size and computing the cardiac stroke volume from the flow wave velocity and the aortic root size.

23. The method of Claim 22 further comprising the steps of changing the position of the probes relative to a level corresponding to the patient's heart, measuring absorbance and blood pressure at the changed position, and computing flow wave velocity.

24. The method of Claim 20, further comprising the steps of:

determining oxygen saturation of the patient's blood from the absorbance;

comparing absorbance at the first probe at a first pulse to absorbance at the second probe at the first pulse and subsequent pulses;

determining matching of oxygen separation of pulses from the first and second probes;

estimating the blood volume and physical separation of the first and second probes; and

computing the blood volume displaced.

25. A method for noninvasively determining a physiological characteristic of a patient's blood comprising the steps of:

providing a first tissue probe having a first radiation emitter with a first wavelength and a first radiation detector configured to receive the first wavelength after absorbance through the patient's blood;

providing a second tissue probe having a second radiation emitter with a second wavelength and a second radiation detector configured to receive the second wavelength after absorbance through the patient's blood;

positioning the first and second probes at locations on the patient;

measuring absorbance of the patient's blood at the opposing locations by emitting radiation through the patient's blood and detecting the radiation after passage through the patient's blood;

determining a blood parameter by comparing absorbance at the locations;

moving the first probe relative to a level corresponding to the patient's heart to a second position;

measuring absorbance at the second position;

computing the blood parameter based on the absorbance at the second position; and

determining the physiological characteristic by comparing the absorbance at the first and second position and the absorbance at the first and second probes.